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Agricultural Memorandum No. 914

Statistics of dates of last spring and first autumn air frost in South-east England

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Introduction

One of the major hazards facing horticulture in SE England is the potential lateness of spring. The likelihood of late damaging frosts, particularly on sites with little or no frost protection, is an important consideration when calculating the economic risks of growing early crops (with associated high prices).

This memorandum presents statistics on frost frequency for 32 met. stations in the South-east*, following a similar, more widespread analysis for the United Kingdom by Beck (1977). Site details including: location, height above sea level, period of analysis and reference to missing data are given in Table 1. Temperature records for the period 1959-79 were used in the majority of cases with an air frost being defined as a 'screen' minimum temperature $< 0°C$.

The following parameters were calculated for each station:

1. Mean and median date, standard deviation (SD) and upper and lower quartiles of first and last frost (see Tables 2 and 3).

2. Mean duration of frost-free period (Table 4), calculated from average dates of first and last frost.

Corresponding values for the other main fruit growing areas of England, particularly East Anglia, the Vale of Evesham and The South-west peninsula are included at the foot of these tables for comparison purposes.

The information presented in this paper should not be used directly for assessing the frost risk of a proposed or established orchard site. The incidence of frost depends so much upon local topography and land-use that extreme caution should be used when extrapolating data calculated for one site to other sites. However, over flat country, where soil types and soil cover are fairly homogenous the figures of individual stations may be considered as applicable to other sites of similar geography.

Year-to-Year Variations

The mean dates of frost, of course, give no indication of the timing in any one year. The last spring frost, for example, can often occur later than usual when the weather has previously been dry; during a wet (ie generally milder) spring the date is usually much earlier. Crop cover has a similar effect, and a complete cover such as grass sward will enhance lateness in the average date of last frost while fallow or partially covered soils tend to promote an early end to spring frosts, particularly when the top soil layers are moist. (MAFF Tech.Bul.35).

* These statistics are available for any long-term met station in the U.K.

Table 2 shows that, on average, the first autumn frosts in coastal districts occur around mid-late November with an SD of early October - early January. Inland they are likely any time between early October - late November with a peak during late October - early November. The earliest frost occurred at Brighton on 13 August 1961 while several sites along the South coast experienced their first frost as late as 17 March in 1975.

The last spring frosts (Table 3) have a mean date of late April - early May (SD of early April - late May) in inland areas with corresponding values of mid-March - early April (early March - late April) in coastal regions. Margate received its last frost as early as 2nd January in 1974, while Aylesbury and Martyr Worthy during 1959 had a frost as late as 6 June.

The ameliorating effect of the coast is quite noticeable in the South-east. Margate, for instance, has a frost-free period of almost 300 days while only a few miles inland at Manston this figure is down to around 230 days.

Acknowledgement

Many thanks to the data processing section of Met 08a, Bracknell for writing and running the necessary computer programs.

References

1. Beck H (1977). Agricultural Memorandum No 815. "Date of last spring and first autumn air frost in the United Kingdom and runs of days with air frost ".

2. Ministry of Agriculture, Fisheries and Food (MAFF), (1976). "The Agricultural Climate of England and Wales". Technical Bulletin No. 35. HMSO London

Any comments or suggestions should be sent to the author.

March 1981

Table 1.

Station details

Station	Height asl (m)	Period of analysis	N.G.R. East	N.G.R. North	Missing data * month/year
ABINGDON	64	1957 - 74	4479	1991	
ALICE HOLT	115	1959 - 79	4805	1427	
AYLESBURY	96	1959 - 79	4841	2115	
BEXHILL	4	1959 - 79	5737	1072	
BOGNOR REGIS	7	1959 - 79	4934	0989	
BRIGHTON	10	1959 - 79	5313	1040	
BROMLEY	65	1959 - 79	5401	1691	10-12/61, 8-9/62, 8-9/69
CHRISTCHURCH	4	1959 - 79	4154	0938	3/72
EASTBOURNE	7	1959 - 79	5611	0980	
EAST MALLING	39	1959 - 79	5708	1571	
EVERTON	16	1959 - 79	4302	0937	
FAVERSHAM	48	1959 - 79	6007	1593	
FERNHURST	57	1959 - 79	4908	1267	1/72, 6-10/74
GATWICK	59	1959 - 79	5265	1407	
GILLINGHAM	3	1959 - 79	5785	1692	
GOUDHURST	85	1959 - 79	5722	1333	
HADLOW COLLEGE	22	1967 - 79	5628	1497	
HASTINGS	45	1959 - 79	5809	1094	
HAYLING ISLAND	4	1959 - 79	4716	0988	
HEATHROW	25	1959 - 79	5077	1767	
HURLEY	43	1959 - 79	4823	1829	
LECKFORD	117	1959 - 79	4393	1362	
LITTLEHAMPTON	5	1959 - 79	5033	1019	8/64, 12/76
LONG SUTTON	145	1959 - 79	4749	1467	1-2/62, 3/63, 6/63
MANSTON	44	1961 - 79	6335	1666	
MARGATE	16	1959 - 79	6368	1714	
MARTYR WORTHY	84	1959 - 79	4517	1338	
NORTH HEATH	21	1969 - 79	5069	1227	8/73, 10/79
RUSTINGTON	3	1960 - 79	5045	1034	11/69, 12/70, 1-12/72
SHINFIELD	61	1959 - 74	4734	1686	
SOUTH FARNBORO'	77	1957 - 74	4867	1548	
WISLEY	32	1959 - 79	5063	1583	4/72
WYE	56	1959 - 79	6057	1469	
SANTON DOWNHAM	24	1959 - 79	5813	2901	1/75
STRATFORD-UPON-AVON	49	1959 - 79	4164	2549	
PENZANCE	19	1959 - 79	1469	0302	

* NOTE: 8 - 9/62 indicates missing data for August - September 1962. The date of last frost was rejected from the analysis if there were more than 4 days of missing data between detected date and June 30. The date of first frost was rejected if more than 4 days missing data occurred between 15 August and detected date. In missing years the value is replaced by the average.

Table 2.

Means, standard deviations and upper and lower quartiles of first (autumn) frost over the period 1959 - 79 (unless marked *).

Station	Mean	Standard Deviation	Quartiles			Extremes	
			Lower	Median	Upper	Earliest	Latest
* ABINGDON	22 Oct	10 Oct - 4 Nov	13 Oct	23 Oct	1 Nov	30 Sep	14 Nov
ALICE HOLT	4 Nov	18 Oct - 20 Nov	27 Oct	5 Nov	15 Nov	7 Oct	13 Dec
AYLESBURY	27 Oct	11 Oct - 12 Nov	15 Oct	25 Oct	7 Nov	30 Sep	26 Nov
BEXHILL	23 Nov	5 Nov - 12 Dec	13 Nov	19 Nov	27 Nov	5 Nov	26 Jan
BOGNOR REGIS	26 Nov	29 Oct - 23 Dec	13 Nov	21 Nov	29 Nov	4 Nov	17 Mar
BRIGHTON	28 Nov	21 Oct - 6 Jan	11 Nov	25 Nov	13 Dec	13 Aug	17 Mar
BROMLEY	20 Nov	28 Oct - 14 Dec	10 Nov	17 Nov	28 Nov	14 Oct	10 Feb
CHRISTCHURCH	31 Oct	18 Oct - 22 Nov	21 Oct	31 Oct	9 Nov	9 Oct	26 Nov
EASTBOURNE	5 Dec	7 Nov - 3 Jan	18 Nov	1 Dec	17 Dec	4 Nov	17 Mar
EAST MALLING	2 Nov	20 Oct - 15 Nov	26 Oct	4 Nov	10 Nov	6 Oct	26 Nov
EVERTON	10 Nov	29 Oct - 22 Nov	3 Nov	9 Nov	18 Nov	14 Oct	8 Dec
FAVERSHAM	13 Nov	19 Oct - 9 Dec	4 Nov	12 Nov	23 Nov	6 Oct	5 Feb
FERNHURST	26 Oct	12 Oct - 9 Nov	15 Oct	26 Oct	7 Nov	5 Oct	20 Nov
GATWICK	24 Oct	9 Oct - 8 Nov	12 Oct	24 Oct	4 Nov	30 Sep	20 Nov
GILLINGHAM	22 Nov	29 Oct - 17 Dec	8 Nov	18 Nov	2 Dec	23 Oct	6 Feb
GOUDHURST	26 Oct	12 Oct - 11 Nov	15 Oct	27 Oct	7 Nov	30 Sep	26 Nov
* HADLOW COLLEGE	16 Oct	29 Sep - 2 Nov	6 Oct	18 Oct	30 Oct	8 Sep	6 Nov
HASTINGS	5 Dec	6 Nov - 3 Jan	18 Nov	27 Nov	10 Dec	10 Nov	17 Mar
HAYLING ISLAND	27 Nov	30 Oct - 25 Dec	12 Nov	19 Nov	4 Dec	4 Nov	17 Mar
HEATHROW	8 Nov	29 Oct - 18 Nov	2 Nov	9 Nov	17 Nov	14 Oct	27 Nov
HURLEY	28 Oct	12 Oct - 12 Nov	18 Oct	29 Oct	7 Nov	30 Sep	26 Nov
LECKFORD	31 Oct	16 Oct - 15 Nov	21 Oct	31 Oct	11 Nov	7 Oct	30 Nov
LITTLEHAMPTON	20 Nov	30 Oct - 11 Dec	9 Nov	15 Nov	24 Nov	1 Nov	19 Jan
LONG SUTTON	4 Nov	16 Oct - 22 Nov	25 Oct	6 Nov	17 Nov	22 Sep	8 Dec
* MANSTON	19 Nov	10 Nov - 28 Nov	14 Nov	19 Nov	25 Nov	6 Nov	14 Dec
MARGATE	18 Dec	28 Nov - 6 Jan	5 Dec	17 Dec	31 Dec	16 Nov	28 Jan
MARTYR WORTHY	26 Oct	8 Oct - 13 Nov	18 Oct	29 Oct	6 Nov	31 Aug	26 Nov
* NORTH HEATH	24 Oct	4 Oct - 13 Nov	10 Oct	26 Oct	11 Nov	29 Sep	26 Nov
* RUSTINGTON	6 Nov	21 Oct - 21 Nov	2 Nov	7 Nov	12 Nov	7 Oct	10 Dec
* SHINFIELD	28 Oct	15 Oct - 10 Nov	21 Oct	31 Oct	8 Nov	5 Oct	21 Nov
* SOUTH FARNBORO'	24 Oct	10 Oct - 7 Nov	15 Oct	26 Oct	4 Nov	30 Sep	21 Nov
WISLEY	28 Oct	14 Oct - 12 Nov	19 Oct	31 Oct	8 Nov	30 Sep	21 Nov
WYE	6 Nov	24 Oct - 18 Nov	31 Oct	6 Nov	13 Nov	14 Oct	29 Nov
SANTON DOWNHAM	2 Sep	31 Jul - 5 Oct	19 Aug	13 Sep	28 Sep	2 Jul	6 Nov
STRATFORD-UPON-AVON	14 Oct	25 Sep - 2 Nov	1 Oct	15 Oct	31 Oct	16 Sep	18 Nov
PENZANCE	3 Dec	17 Nov - 19 Dec	23 Nov	2 Dec	15 Dec	5 Nov	10 Jan

Table 3.

Means, standard deviations and quartile ranges of last (spring) frost over the period 1959 - 79 (unless marked *).

Station	Mean	Standard Deviation	Quartiles			Extremes	
			Lower	Median	Upper	Earliest	Latest
* ABINGDON	21 Apr	6 Apr - 5 May	13 Apr	25 Apr	2 May	16 Mar	8 May
ALICE HOLT	26 Apr	7 Apr - 16 May	19 Apr	28 Apr	7 May	20 Feb	28 May
AYLESBURY	4 May	18 Apr - 21 May	23 Apr	3 May	15 May	7 Apr	6 Jun
BEXHILL	30 Mar	9 Mar - 19 Apr	14 Mar	1 Apr	15 Apr	20 Feb	3 May
BOGNOR REGIS	30 Mar	13 Mar - 17 Apr	19 Mar	1 Apr	13 Apr	20 Feb	3 May
BRIGHTON	22 Mar	27 Feb - 13 Apr	7 Mar	23 Mar	9 Apr	27 Jan	3 May
BROMLEY	4 Apr	13 Mar - 26 Apr	19 Mar	10 Apr	21 Apr	19 Feb	30 Apr
CHRISTCHURCH	20 Apr	5 Apr - 5 May	12 Apr	23 Apr	2 May	19 Mar	15 May
EASTBOURNE	12 Mar	15 Feb - 7 Apr	27 Feb	19 Mar	3 Apr	20 Jan	11 Apr
EAST MALLING	1 May	15 Apr - 18 May	25 Apr	1 May	10 May	26 Mar	4 Jun
EVERTON	7 Apr	16 Mar - 30 Apr	27 Mar	12 Apr	25 Apr	20 Feb	5 May
FAVERSHAM	23 Apr	7 Apr - 10 May	17 Apr	27 Apr	4 May	22 Mar	21 May
FERNHURST	4 May	22 Apr - 18 May	28 Apr	3 May	12 May	12 Apr	2 Jun
GATWICK	4 May	20 Apr - 17 May	27 Apr	2 May	10 May	10 Apr	3 Jun
GILLINGHAM	31 Mar	9 Mar - 23 Apr	18 Mar	1 Apr	18 Apr	10 Feb	3 May
GOUDHURST	8 May	24 Apr - 22 May	29 Apr	6 May	16 May	9 Apr	4 Jun
* HADLOW COLLEGE	8 May	27 Apr - 19 May	2 May	8 May	17 May	17 Apr	31 May
HASTINGS	19 Mar	23 Feb - 12 Apr	3 Mar	21 Mar	8 Apr	21 Jan	30 Apr
HAYLING ISLAND	29 Mar	8 Mar - 19 Apr	22 Mar	3 Apr	13 Apr	10 Feb	3 May
HEATHROW	5 Apr	17 Mar - 3 May	26 Mar	6 Apr	17 Apr	23 Feb	4 May
HURLEY	4 May	19 Apr - 19 May	25 Apr	2 May	12 May	10 Apr	1 Jun
LECKFORD	20 Apr	3 Apr - 6 May	4 Apr	20 Apr	30 Apr	14 Mar	27 May
LITTLEHAMPTON	29 Mar	6 Mar - 21 Apr	18 Mar	2 Apr	14 Apr	31 Jan	4 May
LONG SUTTON	20 Apr	1 Apr - 8 May	11 Apr	22 Apr	1 May	12 Mar	31 May
* MANSTON	8 Apr	21 Mar - 25 Apr	30 Mar	10 Apr	21 Apr	7 Mar	6 May
MARGATE	28 Feb	5 Feb - 24 Mar	13 Feb	3 Mar	19 Mar	2 Jan	4 Apr
MARTYR WORTHY	30 Apr	14 Apr - 15 May	17 Apr	28 Apr	6 May	9 Apr	6 Jun
* NORTH HEATH	1 May	22 Apr - 11 May	29 Apr	1 May	8 May	10 Apr	15 May
* RUSTINGTON	25 Apr	10 Apr - 9 May	16 Apr	24 Apr	2 May	28 Mar	2 Jun
* SHINFIELD	18 Apr	27 Mar - 10 May	11 Apr	22 Apr	3 May	20 Feb	28 May
* SOUTH FARNBORO'	26 Apr	13 Apr - 9 May	20 Apr	29 Apr	5 May	31 Mar	28 May
WISLEY	26 Apr	5 Apr - 16 May	21 Apr	28 Apr	3 May	20 Feb	31 May
WYE	20 Apr	1 Apr - 8 May	6 Apr	23 Apr	3 May	13 Mar	3 Jun
SANTON DOWNHAM	**3 Jun**	**17 May - 21 Jun**	**23 May**	**6 Jun**	**18 Jun**	**28 Apr**	**30 Jun**
STRATFORD-UPON-AVON	**9 May**	**26 Apr - 12 May**	**30 Apr**	**9 May**	**19 May**	**10 Apr**	**1 Jun**
PENZANCE	**20 Mar**	**19 Feb - 19 Apr**	**3 Mar**	**24 Mar**	**13 Apr**	**16 Jan**	**5 May**

Table 4.

Mean duration of frost-free period over the period 1959 - 79 (unless marked *).

Station	Mean (days)
* ABINGDON	184
ALICE HOLT	192
AYLESBURY	176
BEXHILL	238
BOGNOR REGIS	241
BRIGHTON	251
BROMLEY	230
CHRISTCHURCH	194
EASTBOURNE	268
EAST MALLING	185
EVERTON	217
FAVERSHAM	204
FERNHURST	175
GATWICK	173
GILLINGHAM	237
GOUDHURST	171
* HADLOW COLLEGE	161
HASTINGS	261
HAYLING ISLAND	243
HEATHROW	217
HURLEY	177
LECKFORD	194
LITTLEHAMPTON	236
LONG SUTTON	198
* MANSTON	225
MARGATE	293
MARTYR WORTHY	179
* NORTH HEATH	176
* RUSTINGTON	195
* SHINFIELD	193
* SOUTH FARNBORO'	181
WISLEY	185
WYE	200
SANTON DOWNHAM	91
STRATFORD-UPON-AVON	158
PENZANCE	258